Cloud Computing Strategy: Cloud Server and Architecture

Mrs. Vutharkar. Nagaveni [1] | Dr. Vimal Pandya [2]

[1] Research Scholar, Computer Science, Rai University, Saroda, Dholka Taluka, Ahmadabad,Gujarat ,India -382260.

[2] Director, Navgujart College of Computer Navgujarat Campus Opp. Gujarat Vidaypeeth Ashram Road Ahmedabad 380014

ABSTRACT

Cloud Computing is a new trend in IT environment with a computing platform for the next generation in field of Internet. This paper defines Clouds Computing Definition with formula, Key Component of Cloud, various Service Models and Essential Characteristics. This paper present major component of Clouds Service Orchestration Architecture. This paper includes benefits of cloud Computing with various types of clouds, advantages and disadvantages of cloud computing.

KEYWORDS: Cloud Computing, VMware, Virtualization, LaaS, PaaS, SaaS.

1.Introduction:

Cloud Computing has become one of the most talked about technologies in recent times and has got lots of attention from media as well as analysts because of the opportunities. Cloud computing platforms battle among the Software Company's Google, Amazon and Microsoft in the performance, functions, characteristics, storage , processing ,speed, time bounded factories and architecture etc.

2. Definition of cloud :

VMware, the global leader in virtualization and cloud infrastructure definition "Cloud computing is a new approach that reduces IT complexity by leveraging the efficient pooling of on demand, self-managed virtual infrastructure, consumed as a service"

According to Wikipedia :

"Cloud computing is Internet-based computing, whereby shared resource, software, and information are provided to computers and other devices on demand, like the electricity grid".

Cloud Computing = Software as a Service
+Platform as a Service
+Infrastructure as a Service

3. Key Components of Cloud:

Visual Model Of NIST Working Definition Of Cloud Computing
http://www.csrc.nist.gov/groups/SNS/cloud-computing/index.html
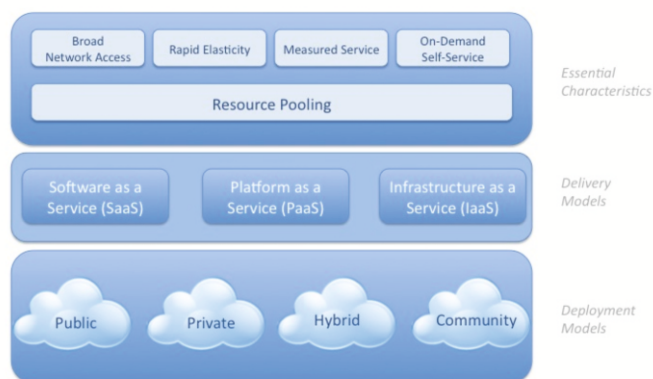
4. Service Models :-
Customers may purchase:
A. Infrastructure as a Service (IaaS)
B. Platform as a Service (PaaS)
C. Software as a Service (SaaS)

A. Infrastructure as a Service (IaaS):-
- Virtualisation of physical Compute Assets
- Storage
- Processing
- No control over underlying cloud infrastructure
- Control over ability to deploy and run software
- operating systems and applications

E.g. Amazon Web Services (AWS)

Used for:
- File Backup
- Temporary Processing – Campaigns, Product Design

B. Platform as a Service (PaaS):-
- Virtual development environment
- Develop & deploy applications for the Cloud
- No control over underlying Cloud infrastructure
- Control over deployed application
- e.g. provisioning and access

**E.g. Google App Engine, Microsoft Azure**

Used for:
- Start-ups – quick way of deploying Cloud apps
- Enterprise productivity - apps for internal to the org
- Enterprise storefronts – means of developing interface between business and public

C. Software as a Service (SaaS):-
- Access to Service Providers Applications that execute on the Cloud
- Accessed via thin client interface such as a web browser (or Smartphone app)
- No control over underlying Cloud infrastructure
- Minimal control over application settings

E.g. Gmail, Google Docs, Drop Box, Face book, Ever note etc...

5. Essential Characteristics:-
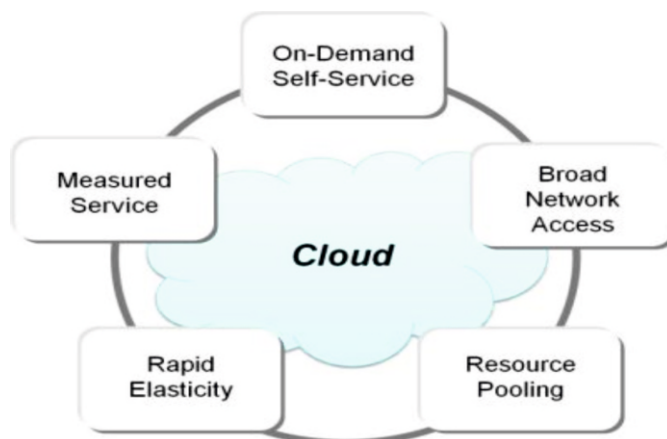
- ❖ On Demand Self Service
- • Commoditised

- ❖ Measured Service
- • Variable Cost Model, pay for capacity you use

- ❖ Resource Pooling
- • High Utilisation & Economies of scale

- ❖ Rapid Elasticity
- • Commission / Decommission Capacity

- ❖ Broad Network Access
- • Accessibility over internet

6. Deployment Models:- Cloud can be deployed in four Models :
- • Public
- • Private
- • Hybrid
- • Community

1. PUBLIC CLOUD:-
- • The cloud infrastructure is made available to the general public or a large industry group and is owned by an organization selling cloud services.

- • In public clouds, resources are offered as a service, usually over an internet connection, for a pay-per-usage fee.

- • Public cloud providers manage the infrastructure and pool resources into the capacity required by its users

- • Public clouds are available to the general public or large organizations, and are owned by a third party organization that offers the cloud service.

- • A public cloud is hosted on the internet and designed to be used by any user with an internet connection to provide a similar range of capabilities and services
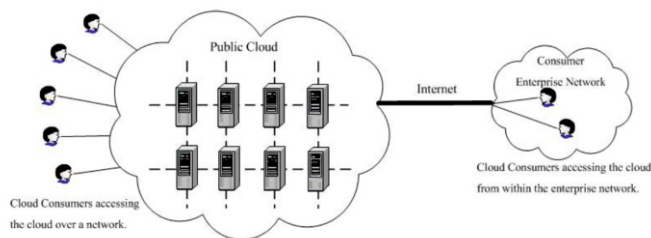
E.g: Amazon AWS, Google App Engine, Microsoft 365 etc

- ❖ **Benefits of Public cloud:**
- • Significant Cost Savings (Economies of Scale, PAYG, Low Overheads)
- • Hi Performance (Super computer power, Latency)
- • Very Flexible (switching on & off Virtualised Hardware and Software)

- ❖ Popular with Small Medium Businesses Access to Power.

- ❖ Comes at cost of loss of control
- • Lack of transparency
- • Sharing of computing assets
- • Your competitor could be using the neighbouring VM – how secure?

- ❖ Multi-tenancy architecture shared by all.

The advantages of public cloud include:
- • Data availability and continuous uptime
- • 24/7 technical expertise
- • On demand scalability
- • Easy and inexpensive setup
- • No wasted resources

Drawbacks of public cloud:
- • Security

2. Private Cloud:
- • Private cloud is cloud infrastructure dedicated to a particular organization.

- • Private clouds allow businesses to host applications in the cloud

- • It is not shared with other organizations, whether managed internally or by a third party and it can be hosted internally or externally.

There are two variations of private clouds:
1. On-Premise Private Cloud:
1. This type of cloud is hosted with in an organizations own facility.

2. A businesses IT department would incur the capital and operational costs for the physical resources with this model.

3. OnPremise Private Clouds are best used for applications that require complete control and configurability of the infrastructure and security.

**2. Externally Hosted Private Cloud:**
1. Externally hosted private clouds are also exclusively used by one organization, but are hosted by a third party specializing in cloud infrastructure.

2. The service provider facilitates an exclusive cloud environment with full guarantee of privacy.

3. This format is recommended for organizations that prefer not to use a public cloud infrastructure due to the risks associated with the sharing of physical resources.
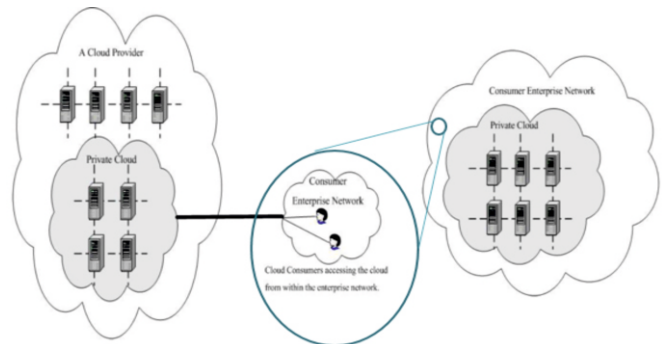
- • Not shared - operated solely for a single organization.

- • Hosted / Non Hosted Solutions

- • Benefit: Under enterprise control

- • Whilst VM architecture essential, it will lack benefits of sharing:
- · Cost; Scalability; Performance

3.Hybrid Cloud:-
- • Hybrid Clouds are a composition of two or more clouds (private, community or public) that remain unique entities, but are bound together offering the advantages of multiple deployment models.

- • Hybrid cloud architecture requires both on-premise resources and off-site server based cloud infrastructure.

- • To use a SaaS application, but is concerned about security.

- • Use a public cloud to interact with the clients, but keep their data secured with in a private cloud.

- • Provide public cloud to the customers while using a private cloud for internal IT.
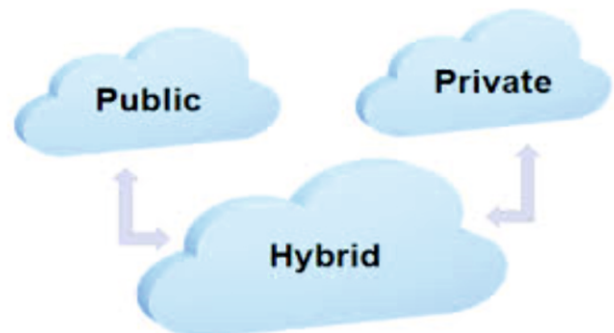
Advantages of Hybrid Cloud:-
- • Reduces capital expenses.
- • Improves resource allocation.
- • Controls available in both a Private Cloud and Public Cloud.
- • Provides drastic improvements in the overall organizational.

Drawbacks of Hybrid Cloud:-
- Risks associated with the security policies.
- Extends the IT perimeter outside the organizational boundaries, opens up a larger surface area for attacks in the hybrid cloud infrastructure under the control of the service provider.

4.Community Cloud :-

A community cloud is a multi-tenant Cloud service model that is shared among several or organizations and governed, managed and secured commonly by all the participating organizations or a third party managed service provider.

- Community clouds are a hybrid form of private clouds built and operated specifically for a targeted group.

- These communities have similar cloud requirements and their ultimate goal is to work together to achieve their business objectives.

Community cloud environment is best for :-
- Government organizations within a state that need to share resources.
- A private HIPAA compliant cloud for a group of hospitals or clinics.
- Telco community cloud for Telco DR to meet specific FCC regulations.


Advantages of community cloud:-
- Cheaper due to the division of costs among all participants.
- Tracking and just-in-time production and distribution.

Drawbacks of Community Cloud:-
- Costs higher than public cloud
- Fixed amount of bandwidth and data storage is shared among all community members

7.CloudService Orchestration Architecture
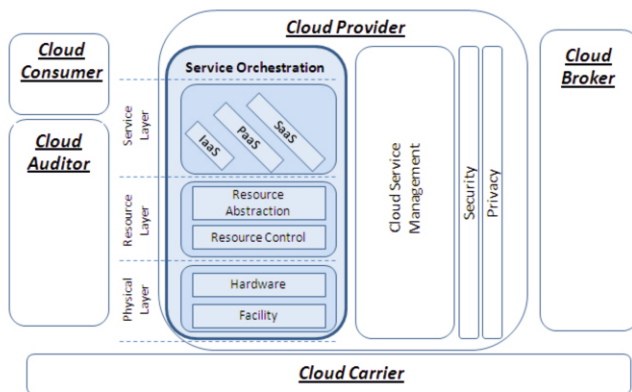
Cloud Service Orchestration :-
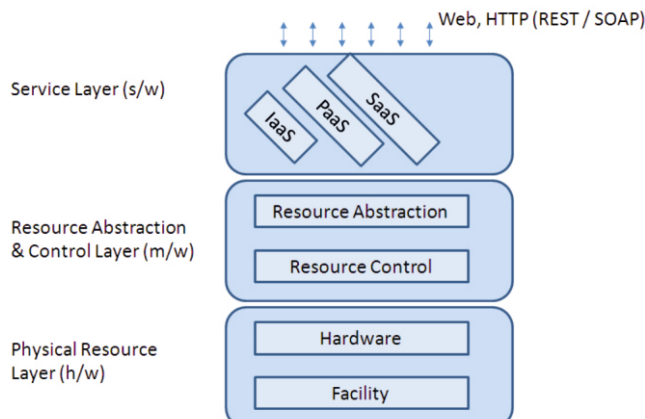
Resource Abstraction & Control Layer :-
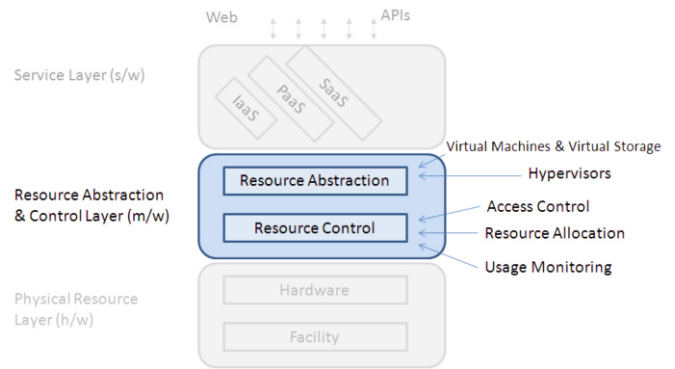
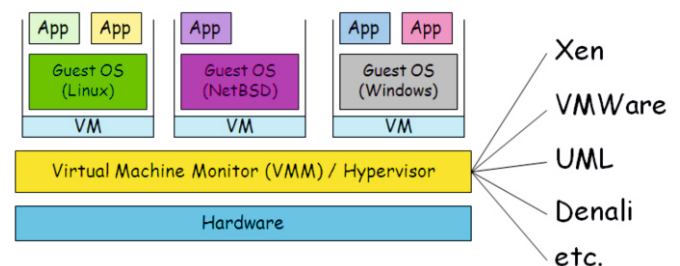**Virtualization :-**
Virtual workspaces:
- An abstraction of an execution environment that can be made dynamically available to authorized clients by using well-defined protocols,

- Resource quota (e.g. CPU, memory share),

- Software configuration (e.g. O/S, provided services).

Implement on Virtual Machines (Vms):
- Abstraction of a physical host machine,
- Hypervisor intercepts and emulates instructions from VMs, and allows management of Vms,
- VMware, Xen, etc.

Provide infrastructure API:
- Plug-ins to hardware/support structures

Virtual Machines :-

Virtualization in General :
Advantages of virtual machines:
- Run operating systems where the physical hardware is unavailable,
- Easier to create new machines, backup machines, etc.,
- Software testing using "clean" installs of operating systems and software,
- Emulate more machines than are physically available,
- Timeshare lightly loaded systems on one host,
- Debug problems (suspend and resume the problem machine),
- Easy migration of virtual machines (shutdown needed or not).
- Run legacy systems!

Services Orchestration:
Infrastructure as a Service (IaaS) :

https://aws.amazon.com/types-of-cloud-computing/
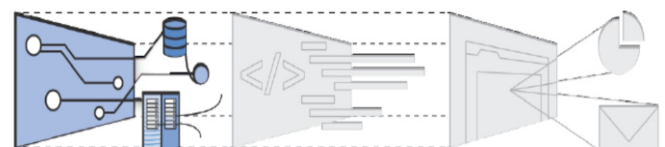
IaaS is not Managed Hosting:
Traditional managed hosting is a form of web hosting where a user chooses to lease entire server(s) housed in an off-site data center.

- Term based contracts based on projected resource requirements

IaaS Examples :-

Platform as a Service (PaaS):
PaaS provides all of the facilities required to support the complete life cycle of building and delivering web applications and services entirely from the Internet.

• Typically applications must be developed with a particular platform in mind.

• Multi tenant environments.
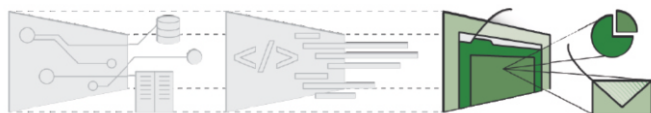
• Highly scalable multi tier architecture.
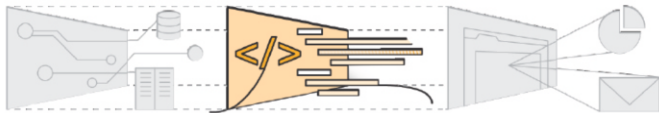
PaaS Examples:

Software as a Service (SaaS):
SaaS is a software delivery methodology that provides licensed multi-tenant access to software and its functions remotely as a Web-based service.
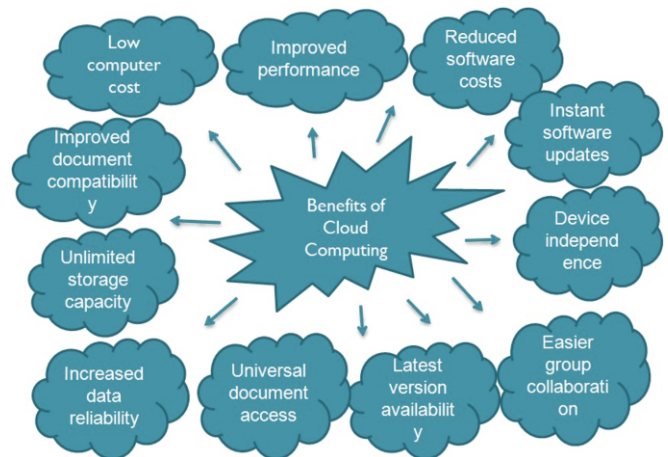
• Usually billed based on usage

• Usually multi tenant environment

• Highly scalable architecture

SaaS Examples:

8. Advantages of Cloud Computing:-

Lower computer costs:
• You do not need a high-powered and high-priced computer to run cloud computing web-based applications.

• Since applications run in the cloud, not on the desktop PC, your desktop PC does not need the processing power or hard disk space demanded by traditional desktop software.

• When you are using web-based applications, your PC can be less expensive, with a smaller hard disk, less memory, more efficient processor.

• In fact, your PC in this scenario does not even need a CD or DVD drive, as no software programs have to be loaded and no document files need to be saved

Improved performance:
• With few large programs hogging your computer's memory, you will see better performance from your PC.

• Computers in a cloud computing system boot and run faster because they have fewer programs and processes loaded into memory…

Reduced software costs:
• Instead of purchasing expensive software applications, you can get most of what you need for free-issue!

• (most cloud computing applications today, such as the Google Docs suite.)

• better than paying for similar commercial software

• (which alone may be justification for switching to cloud applications.)

Instant software updates:
• Another advantage to cloud computing is that you are no longer faced with choosing between obsolete software and high upgrade costs.

• When the application is web-based, updates happen automatically

• (available the next time you log into the cloud.)

• When you access a web-based application, you get the latest version

• (without needing to pay for or download an upgrade.)

• Improved document format compatibility.

• You do not have to worry about the documents you create on your machine being compatible with other users' applications or OS as

• There are potentially no format incompatibilities when everyone is sharing documents and applications.

Unlimited storage capacity:
• Cloud computing offers virtually limitless storage.

• Your computer's current 1 Tbyte hard drive is small compared to the hundreds of Pbytes available in the cloud.

Increased data reliability:
• Unlike desktop computing, in which if a hard disk crashes and destroy all your valuable data, a computer crashing in the cloud should not affect the storage of your data.

- (if your personal computer crashes, all your data is still out there in the cloud, still accessible.)

- In a world where few individual desktop PC users back up their data on a regular basis, cloud computing is a data-safe computing platform!

Universal document access:
- That is not a problem with cloud computing, because you do not take your documents with you.

- Instead, they stay in the cloud, and you can access them whenever you have a computer and an Internet connection

- **Documents are instantly available from wherever you are**

Latest version availability:
- When you edit a document at home, that edited version is what you see when you access the document at work.

- The cloud always hosts the latest version of your documents

- (as long as you are connected, you are not in danger of having an outdated version.)

Easier group collaboration:
- Sharing documents leads directly to better collaboration.

- Many users do this as it is an important advantages of cloud computing

- (multiple users can collaborate easily on documents and projects.)

- Device independence.

- You are no longer tethered to a single computer or network.

- Changes to computers, applications and documents follow you through the cloud.

Move to a portable device, and your applications and documents are still available.

9. Disadvantages of Cloud Computing:-
Requires a constant Internet connection:
- Cloud computing is impossible if you cannot connect to the Internet.

- Since you use the Internet to connect to both your applications and documents, if you do not have an Internet connection you cannot access anything, even your own documents.

- A dead Internet connection means no work and in areas where Internet connections are few or inherently unreliable, this could be a deal-breaker.

Does not work well with low-speed connections:
- Similarly, a low-speed Internet connection, such as that found with dial-up services, makes cloud computing painful at best and often impossible.

- Web-based applications require a lot of bandwidth to download, as do large documents.

Features might be limited:
- This situation is bound to change, but today many web-based applications simply are not as full-featured as their desktop-based applications.

- (For example, you can do a lot more with Microsoft PowerPoint than with Google Presentation's web-based offering.)

Stored data might not be secure:
- With cloud computing, all your data is stored on the cloud.

- (The questions is How secure is the cloud?)

- Can unauthorized users gain access to your confidential data?

Stored data can be lost:
- Theoretically, data stored in the cloud is safe, replicated across multiple machines.

- But on the off chance that your data goes missing, you have no physical or local backup.

- (Put simply, relying on the cloud puts you at risk if the cloud lets you down.)

HPC Systems:
- Not clear that you can run compute-intensive HPC applications that use MPI/Open MPI

- Scheduling is important with this type of application

- (as you want all the VM to be co-located to minimize communication latency!)

General Concerns:
- Each cloud systems uses different protocols and different APIs

- (may not be possible to run applications between cloud based systems)

- Amazon has created its own DB system (not SQL 92), and workflow system (many popular workflow systems out there)

- (so your normal applications will have to be adapted to execute on these platforms.)

Can be slow:
- Even with a fast connection, web-based applications can sometimes be slower than accessing a similar software program on your desktop PC.

- Everything about the program, from the interface to the current document, has to be sent back and forth from your computer to the computers in the cloud.

- If the cloud servers happen to be backed up at that moment, or if the Internet is having a slow day, you would not get the instantaneous access you might expect from desktop applications.

10. Conclusion:-
This paper presents a concept of Cloud Computing along with research challenges in storage of various infrastructure, functions, task, performance etc. It also focus on merits and demerits of the cloud computing and various types of services provided towards the customer satisfactions and requirements.

11.REFERENCES:-

1. Brian Hayes, "Cloud Computing," Communications of the ACM, vol. 51, Iss. 7, July, 2008, pp. 9–11.

2. [Online: January, 2012] Searchcloudcomputing, What is CloudComputing?; http://searchcloudcomputing.techtarget.com/definition/cloud-computing.

3. Greg Boss, Padma Malladi, Dennis Quan, Linda Legregni, Harold Hall, "Cloud Computing", IBM Paper, October, 2007.

4. [Online: January, 2012] Microsoft Windows Azure; http://www.windowsazure.com/en-us/.

5. [Online: January, 2012] Google Docs; http://docs.google.com/

6. [Online: January, 2012] Google App Engine; http://code.google.com/appengine/

7. [Online: January, 2012] Amazon.com, Amazon Elastic Compute Cloud (Amazon EC2); http://aws.amazon.com/ec2

8. [Online: January, 2012] Amazon Simple Storage Service in Web;http://aws.amazon.com/s3

9. Source from: https://aws.amazon.com/typesofcloudcomputing "Types of cloud computing"

10. Rehan Salem (831015-T132)"CLOUD COMPUTING'S EFFECT ON ENTERPRISES" "…in terms of Cost and Security" January, 2011.

11. Sumit Goyal " Public vs Private vs Hybrid vs Community - Cloud Computing: A Critical Review " Published Online February 2014 in MECS (http://www.mecs-press.org/) DOI: 10.5815/ijcnis.2014.03.03 P:20-29.

12. Josh Ames "Types of Cloud Computing: Private, Public and Hybrid Clouds" (http://www.appcore.com/typescloudcomputingprivatepublichybridclouds), November 18, 2013